Amendments to the Claims:

This listing of the claims will replace all prior versions, and listings of claims in the application.

Listings of Claims:

1. (Original) A spin-valve thin-film magnetic element comprising:

a substrate;

an antiferromagnetic layer;

a pinned magnetic layer in contact with the antiferromagnetic layer, the magnetization vector of the pinned magnetic layer being pinned by an exchange coupling magnetic field between the antiferromagnetic layer and the pinned magnetic layer;

a nonmagnetic conductive layer in contact with the pinned magnetic layer;

a free magnetic layer in contact with the nonmagnetic conductive layer;

an exchange bias layer for magnetizing the free magnetic layer so that the magnetization vector of the free magnetic layer is substantially orthogonal to the magnetization vector of the pinned magnetic layer;

a pair of electrode layers for supplying a sensing current to the pinned magnetic layer, the nonmagnetic conductive layer, and the free magnetic layer; and

a mean-free-path-extending layer provided between the free magnetic layer and the exchange bias layer for controlling the magnitude of an exchange coupling magnetic field between the free magnetic layer and the exchange bias layer and for extending the mean free path of conduction electrons.

2. (Original) A spin-valve thin-film magnetic element according to claim 1, wherein the mean-free-path-extending layer includes a back layer comprising a nonmagnetic conductive material.

3. (Original) A spin-valve thin-film magnetic element according to claim 2, wherein the back layer has a thickness in the range of 5 to 30 angstroms.

4. (Original) A spin-valve thin-film magnetic element according to claim 2, wherein the back layer comprises at least one element selected from the group consisting of Au, Ag, and Cu.

5. (Original) A spin-valve thin-film magnetic element according to claim 3, wherein the back layer comprises at least one element selected from the group consisting of Au, Ag, and Cu.

6. (Original) A spin-valve thin-film magnetic element according to claim 5, wherein the back layer comprises Cu and has a thickness in the range of 15 to 25 angstroms.

7. (Original) A spin-valve thin-film magnetic element according to claim 1, wherein the mean-free-path-extending layer includes a mirror reflective layer comprising an insulating material.

8. (Original) A spin-valve thin-film magnetic element according to claim 2, wherein the mean-free-path-extending layer includes a mirror reflective layer comprising an insulating material disposed between the exchange bias layer and the back layer.

9. (Original) A spin-valve thin-film magnetic element according to claim 7, wherein the mirror reflective layer has a thickness in the range of 5 to 500 angstroms.

10. (Original) A spin-valve thin-film magnetic element according to claim 8, wherein the total thickness of the mirror reflective layer and the back layer is in the range of 5 to 500 angstroms.

11. (Original) A spin-valve thin-film magnetic element according to claim 7, wherein the mirror reflective layer comprises a substance which can form a high energy gap having a high probability of mirror reflection maintaining the spin state of the conduction electrons.

12. (Original) A spin-valve thin-film magnetic element according to claim 8, wherein the mirror reflective layer comprises a substance which can form a high energy gap having a high probability of mirror reflection maintaining the spin state of the conduction electrons.

13. (Original) A spin-valve thin-film magnetic element according to claim 9, wherein the mirror reflective layer comprises a substance which can form a high energy gap having a high probability of mirror reflection maintaining the spin state of the conduction electrons.

14. (Original) A spin-valve thin-film magnetic element according to claim 10, wherein the mirror reflective layer comprises a substance which can form a high energy gap having a high probability of mirror reflection maintaining the spin state of the conduction electrons.

15. (Original) A spin-valve thin-film magnetic element according to claim 1, wherein the antiferromagnetic layer, the pinned magnetic layer, the nonmagnetic conductive layer, the free magnetic layer, and the exchange bias layer are deposited in that order on the substrate.

16. (Original) A spin-valve thin-film magnetic element according to claim 1, wherein the exchange bias layer, the free magnetic layer, the nonmagnetic conductive layer, the pinned magnetic layer, and the antiferromagnetic layer are deposited in that order on the substrate.

17. (Original) A spin-valve thin-film magnetic element according to claim 1, wherein the pair of electrode layers lie at least on two sides in the planar direction of the free magnetic layer.

18. (Original) A spin-valve thin-film magnetic element according to claim 17, wherein the pair of electrode layers lie at least on two sides in the planar direction of the free magnetic layer, the nonmagnetic conductive layer, and the pinned magnetic layer.

19. (Original) A spin-valve thin-film magnetic element according to claim 1, wherein at least one of the pinned magnetic layer and the free magnetic layer is divided into two sublayers by a nonmagnetic interlayer, said sublayers being in a ferri-magnetic state in which the magnetization vectors thereof are antiparallel to each other.

20. (Original) A spin-valve thin-film magnetic element according to claim 1, wherein each of the antiferromagnetic layer and the exchange bias layer comprises an alloy comprising Mn and at least one element selected from the group consisting of Pt, Pd, Ir, Rh, Ru, Os, Au, Ag, Cr, Ni, Ne, Ar, Xe, and Kr.

21. (Original) A spin-valve thin-film magnetic element according to claim 20, wherein the antiferromagnetic layer comprises an alloy represented by the following formula:

X_mMn_{100-m}

wherein X is at least one element selected from the group consisting of Pt, Pd, Ir, Rh, Ru, and Os, and the subscript m is in the range of 48 atomic percent $\leq m \leq$ 60 atomic percent.

22. (Original) A spin-valve thin-film magnetic element according to claim 20, wherein the exchange bias layer comprises an alloy represented by the following formula:

X_mMn_{100-m}

wherein X is at least one element selected from the group consisting of Pt, Pd, Ir, Rh, Ru, and Os, and the subscript m is in the range of 52 atomic percent $\leq m \leq 60$ atomic percent.

23. (Original) A spin-valve thin-film magnetic element according to claim 20, wherein the antiferromagnetic layer comprises an alloy represented by the following formula:

$Pt_mMn_{100-m-n}Z_n$

wherein Z is at least one element selected from the group consisting of Pd, Ir, Rh, Ru, and Os, and the subscripts m and n are in the ranges of 48 atomic percent $\leq m + n \leq 60$ atomic percent and 0.2 atomic percent $\leq n \leq 40$ atomic percent.

24. (Original) A spin-valve thin-film magnetic element according to claim 20, wherein the exchange bias layer comprises an alloy represented by the following formula:

$Pt_mMn_{100-m-n}Z_n$

wherein Z is at least one element selected from the group consisting of Pd, Ir, Rh, Ru, and Os, and the subscripts m and n are in the ranges of 52 atomic percent $\leq m + n \leq 60$ atomic percent and 0.2 atomic percent $\leq n \leq 40$ atomic percent.

25. (Original) A spin-valve thin-film magnetic element according to claim 20, wherein the antiferromagnetic layer comprises an alloy represented by the following formula:

$Pt_qMn_{100-q-j}L_j$

wherein L is at least one element selected from the group consisting of Au, Ag, Cr, Ni, Ne, Ar, Xe, and Kr, and the subscripts q and j are in the ranges of 48 atomic percent $\leq q + j \leq 60$ atomic percent and 0.2 atomic percent $\leq j \leq 10$ atomic percent.

26. (Original) A spin-valve thin-film magnetic element according to claim 20, wherein the exchange bias layer comprises an alloy represented by the following formula:

$Pt_qMn_{100-q-j}L_j$

wherein L is at least one element selected from the group consisting of Au, Ag, Cr, Ni, Ne, Ar, Xe, and Kr, and the subscripts q and j are in the ranges of 52 atomic percent $\leq q + j \leq 60$ atomic percent and 0.2 atomic percent $\leq j \leq 10$ atomic percent.

27. (Withdrawn).

28. (Withdrawn).

29. (Withdrawn).

30. (Withdrawn).

31. (Withdrawn).

32. (Withdrawn).

33. (Withdrawn).

34. (Withdrawn).

35. (Withdrawn).

36. (Withdrawn).